Methane Emission from a Simulated Hypersaline Microbial Mat

Kelly L.M. Decker
Environmental Systems Science and Policy
California State University-Monterey Bay
MS 242-4 NASA-Ames Research Center; Moffett Field, CA 94035
U.S.A.
kdecker@mail.arc.nasa.gov

Christopher S. Potter
Ecosystem Science and Technology Branch
NASA-Ames Research Center
U.S.A.

Tori Hoehler
Exobiology Branch
NASA-Ames Research Center
U.S.A.

Victoria Orphan
Environmental Science and Engineering
California Institute of Technology
U.S.A.

Brad M. Bebout
Exobiology Branch
NASA-Ames Research Center
U.S.A.

We present here a simulation model of methanogenesis in hypersaline mats. This represents a new addition to our current published model (MBGC-Microbial BioGeoChemistry) that simulates O_2, DIC, and sulfide cycling by cyanobacteria and sulfur bacteria (Decker *et al.* (in press) FEMS Microbiology Ecology). Our approach is to use Michaelis-Menten dynamics to describe limits imposed on methanogenesis by substrates, environmental parameters, and other bioactive chemicals. These can be described by the equation:

f(MET) = Vmax*f(methylated substrates,'MS')*f(O_2)*f(salinity)*f(temperature);

where vmax is the maximum reported methanogenesis rate given unlimited supply of methanol and methylamines as substrates (MS) that are not used by sulfate-reducing bacteria (SRB). We assume that MS have a saturating relationship to methanogenesis in MBGC, and is the sole substrate group for methanogenesis in this hypersaline mat where [SO_4^{-2}] does not limit SRB activity. MS are derived from the osmoregulants glycine betaine and choline. MS are accumulated as compatable solutes by cyanobacteria, then released when the cyanobacteria die and decompose. The supply rate of MS to methanogens within the mat is currently unknown. In order to model MS supply to methanogens within each 0.5mm mat layer, we use greenhouse and literature values of

methanogenesis under near-optimal environmental and chemical conditions in hypersaline mats and work backwards. Salinity and temperature affect methanogenesis via optimum functions with distinct maximums. The methanogen function is then used in a larger equation that includes biomass and mat physical properties to model CH_4 production. Methane then diffuses up through the diffusive boundry layer and out of the mat.

This is a sample of the text for your abstract. Do not indent each paragraph, but do skip a line between paragraphs. A maximum of 250 words is permitted in the abstract body. Do not change the formatting for any of the text in this template, and do not add page numbers, a header or footer. Finally, remember to delete the "additional authors" line, and leave two lines between the last author's address and the beginning of the abstract text.